JOURNAL OF TECHNOLOGY MANAGEMENT AND TECHNOPRENEURSHIP

Identifying the Future Drivers of AI-Powered Virtual Shopping Assistants among Malaysian Retailers: A Foresight Study

Yasmin Dania Khairul Hisham[a], Nor Hazana Abdullah[b]

[ab]*Universiti Tun Hussein Onn Malaysia, 86400 Batu Pahat, Johor, Malaysia*

Abstract

Numerous sectors have been transformed by artificial intelligence (AI), and the retail sector is no exception. AI-powered virtual shopping assistants make the shopping process more convenient, efficient, and personalised, yet their future prevalence and impact remain uncertain. This study employed a foresight analysis framework, which integrated horizon scanning, STEEPV analysis, impact–uncertainty analysis, and scenario building, to anticipate the future development of AI-powered virtual shopping assistants among Malaysian retailers. Drivers identified through STEEPV were evaluated for their potential impact and uncertainty via a survey of online retailers in Malaysia. Six merged key drivers emerged, with "data security and privacy concerns" and "the algorithms of AI virtual assistants" identified as the most critical. These were used to construct four alternative future scenarios: *trustworthy reputation, higher engagement levels, expectation of accuracy,* and *lack of trust.* The findings provide insights into the drivers shaping AI adoption and offer valuable foresight for retailers and policymakers to prepare for potential trajectories of virtual shopping assistants over the next five to ten years.

Keywords: Artificial Intelligence, Virtual Shopping Assistant, Online retail, Foresight Analysis.

1. Introduction

Shopping refers to the act of a customer browsing through the goods or services provided by one or more retailers with the possibility of planning to make a purchase of one of them. Researchers have developed a typology of shopper types that identifies one type of shopper as recreational shoppers, or people who enjoy shopping and see it as a leisure activity (Mishra, 2015). Since consumers can now order goods from different regions and conduct product research online, it has significantly disrupted the retail sector. The homes, offices, or other locations that customers choose are where they receive their purchases from online retailers. Consumers can now choose any product from a retailer's website and have it delivered within a reasonable amount of time thanks to the B2C (business to consumer) process. Customers can save energy by using online shopping techniques instead of travelling to actual stores. By doing this, they reduce travel time and expenses. When it comes to retail, the rise of e-commerce has significantly impacted the traditional brick-and-mortar model. Physical stores and online stores each have their own advantages and disadvantages (Abigail, 2023).

Global e-commerce increased from 15% of all retail sales in 2019 to 21% in 2021, according to Morgan Stanley's Global E-commerce Growth Forecast 2022 Report. Currently, it accounts for about 22% of sales. The e-commerce market, according to Morgan Stanley, has a lot of room to grow and could go from $3.3 trillion today to $5.4 trillion in 2026. By 2026, they expect e-commerce to account for 27% of all retail sales. The result is a more intense level of competition that pushes businesses to grow while also becoming more inventive and efficient. Technology has brought about outstanding disruptions and quick changes in the retail industry in recent years. As an example, Amazon has completely changed the way people shop and replaced numerous physical stores with its technologically driven innovations, which include one-click ordering, personalized recommendations, smart speakers, and anticipatory shipping.

Businesses are becoming more and more receptive to artificial intelligence (AI). A few of the clever uses that come under the umbrella of artificial intelligence (AI) technology are robotics, machine learning, natural language processing, and computer vision (Elbanna, 2020; Elbanna et al., 2020). In 2020, Magoulas and Swoyer conducted a study which revealed that 85% of the organizations surveyed were either in the process of implementing AI-based apps or had already done so. In fact, because of the response to and recovery from Covid-19, conversational AI systems (such as AI chatbots and voice assistants) are now handling an estimated 250% more interactions across a variety of business sectors (Comes et al., 2021; MarketWatch, 2022). Artificial intelligence chatbots and virtual assistants have grown in popularity as tools for companies looking to enhance their customer support operations in recent years. As a result, they are increasingly important in many companies' customer support strategies.

Despite the global surge in AI-powered applications, scholarly attention to virtual shopping assistants within Malaysia's retail sector remains sparse indeed, limited studies have explored AI adoption intentions in Malaysian retail

contexts (Chin et al. 2024). Over the past decade, only a handful of studies have examined AI-related issues among Malaysian retailers, leaving a significant gap in understanding their future adoption pathways.

To address this gap, this study applies a foresight analysis framework (Popper, 2011) to anticipate possible paths for AI-powered virtual shopping assistants among Malaysian retailers. Specifically, the study seeks to answer the following research questions:

(i) What are the future drivers of the use of AI-powered in virtual shopping assistant among online retailers?

(ii) What are the future scenarios of the use of AI-powered in virtual shopping assistant among online retailers?

2 Literature Review

A literature review can contribute to the advancement of knowledge in our fields. It is possible to learn key ideas, investigational strategies, and experimental procedures utilized in a specific field. These investigations draw on a variety of sources, such as books, journals, and papers, to gather data necessary to finish the inquiry. To thoroughly analyze the body of existing literature, the STEEPV analysis would also be included in this section. According to The Western Sydney University Library (2017) "The purpose of a literature review is to gain an understanding of the existing research and debates relevant to a particular topic or area of study, and to present that knowledge in the form of a written report." Thus, it is necessary to understand what virtual shopping assistant and its related issues AI as the core technology of virtual shopping assistants would be discussed prior to others.

2.1. Overview of Artificial Intelligence (AI)

Artificial intelligence (AI) is a multidisciplinary field of computer science that focuses on creating intelligent machines capable of performing tasks that would typically require human intelligence. Additionally, artificial intelligence (AI) is a disruptive invention that has accelerated the digital transformation of the sector over the past ten years (Duan et al., 2019; Dwivedi et al., 2019a). The trait that enables an organism to function effectively and with foresight in its environment is known as intelligence, and Nilsson (2009, p. 13) defines artificial intelligence as the activity committed to making computers intelligent. Machine learning, natural language processing, computer vision, robotics, and expert systems are some of the subfields of AI that it encompasses. Artificial intelligence (AI) would receive attention due to the development of PC systems that can perform tasks and activities that require human intelligence (Samala et al., 2020). In 1956, John McCarthy first appeared in artificial intelligence during his summer studies at Dartmouth College (Samala et al., 2020). Over the years, artificial intelligence has achieved certain success in heuristic search, character recognition, face recognition systems, language processing, and mobile artificial intelligence construction (Samala et al., 2020). By the 1980s, huge abstract progress had been made in the technology-driven field, and its application had also been significantly improved (Samala et al., 2020).

Artificial intelligence (AI) has brought a lot of advantages to us in our life. The first advantage is artificial intelligence would have an occasional error rate compared to humans, if coded properly. They might have unimaginable exactitude, accuracy, and speed (Kumar, 2019). The term "human error" is caused by the misunderstanding of square measurements by humans from time to time. If computers are programmed correctly, they would not produce these errors. Using artificial intelligence, alternative solutions derived from previously collected information apply a specific set of algorithms. As a result, errors are reduced, so the opportunity to achieve accuracy with higher precision may also be an opportunity (Bhbosale et al., 2020). The second advantage of AI is that the AI machines would be reprogrammed for work for very long time while not becoming bored or obtaining tired (Bhbosale et al., 2020). In our daily work, we would play some repetitive tasks, such as sending thank you emails, verifying files for errors, and so on. Using artificial intelligence, we would profitably change these ordinary tasks and may even take away human "boring" tasks, liberate them, and gradually develop their creativity (Bhbosale et al., 2020).

2.2. Virtual Shopping Assistant

A virtual assistant for shopping is a software programme or application powered by artificial intelligence that assists users in their shopping activities. It uses artificial intelligence, machine learning, and natural language processing to facilitate the shopping experience overall and to offer individualised recommendations and help with product searches. Self-checkout kiosks and virtual reality retail environments (Jackson et al., 2014; Speicher et al., 2017) provide customers with an enjoyable and entertaining buying experience. The symbolic and cultural meaning of shopping is undeniable. Being part of our everyday activities, a grocery store is likely to be the most common daily retail experience for consumers. People devote significant amounts of time and money to shopping, and it can be seen as self-defining and self-expressive behaviour (Ali-Kovero et al., 2016). Shopping entails several steps, including determining a need or desire for a specific good or service, learning about the range of options, evaluating them side by side, selecting one, and then paying for it.

2.3. AI-Powered Virtual Shopping Assistant

A digital tool or platform that uses artificial intelligence technology to help customers with their online shopping experience is known as an AI-powered virtual shopping assistant. It is intended to offer guidance throughout the shopping process, respond to questions about products, and make personalised recommendations. Voice-based shopping assistants have been implemented by several companies around digital fashion commerce (Kautish and Rai, 2019). To help customers search for products and make recommendations, Japanese clothing retailer "Uniqlo" partnered with Google, and British retailer ASOS introduced virtual assistants to help customers choose the perfect holiday gift and find the right size. Numerous upscale fashion companies, such as Burberry, Louis Vuitton, Prada, and Tommy Hilfiger, offer AI-based shopping assistants, demonstrating the growing importance of these technologies for fashion purchasing. (Et al., Chung 2020). Social beings are people. Face-to-face communication is the best because of this. However, artificial intelligence and machine learning-based virtual shopping assistants are a close second. In the context of online shopping, you can still get impressive results that are scalable with little work. A little over 57% of online business owners think that bots provide a significant return on investment for almost no implementation costs. For example, Amazon Alexa Voice AI, Walmart's Text to Shop and AliExpress Messenger Shopping Assistant is the examples of companies that using virtual assistants to distribute product information, store shopping carts that have been abandoned, and send alerts.

2.4. Challenges of Online Retailers

Under the pandemic's shadow, Malaysia's e-commerce market has experienced phenomenal expansion. The online retail sales index increased from 22% at the beginning of the year to an average of roughly 33% between March and December 2020 (Senwaveadmin, 2021). Despite the rising numbers of online retailers, there were always challenges coming alongside. One of the challenges that most online retailers were facing was the engagement with customer. The lack of physical interaction with products in ecommerce can also present challenges, particularly with regards to customer satisfaction (Chou, 2015).

Next, consumers may have difficulty assessing product quality and may encounter challenges in returns and refunds (Colla, 2012). Return rates exhibit a similar trend as sales numbers rise, particularly during and after the COVID-19 pandemic. For example, in 2020, American consumers returned $428 billion worth of goods (NRF & Appriss Retail, 2021). E-commerce return rates are said to be at an all-time high of 25%, whereas retail return rates have increased over the past two years from roughly 11% to 17% (Ader et al., 2022). By 2023, online returns are predicted to total $7 billion (Ambikar et al., 2021). This can lead to negative customer experiences, which can harm the reputation of e-commerce companies and discourage repeat business (Zerbini, 2022). Besides that, shopping cart abandonment was also one of the crucial challenges that every online retailer faced. Between 55% and 80% of e-Commerce retailers experience cart abandonment on average. Commerce sites lose $18 billion in sales revenue every year because of customers abandoning their carts, according to industry reports (Rizza, 2023).

One game-changing solution that would be applied to the numerous problems faced by retailers is the incorporation of virtual AI-powered shopping assistants into the online retail environment. To directly address and reduce major issues and promote a more seamless and pleasant shopping experience for both businesses and customers, these intelligent virtual assistants make use of innovative artificial intelligence technologies. Virtual shopping assistants are internet resources that assist consumers in locating the goods they want. Their functions involve assisting customers in dealing with your online store and responding to inquiries (Kazimierz, 2023).

2.5. STEEPV Analysis

In this part, STEEPV would be utilised to delve deeper into the main concerns, issues, and trends on AI-powered Virtual Shopping Assistant. The STEEPV aspects of social, technological, environmental, economic, political, and values would be utilised to categorise the issues, challenges, and trends shown in Appendix A. Table 3.2 lists each of the important phrases associated with the problems and factors. A clear image of the relevant key terms in relation to each of the STEEPV features was intended by creating the table with only the most significant phrases.

Table 3.2: Key Terms Summary of Issues, Challenges, and Trends

Key Drivers	Key Terms	Sources
Social	1. Privacy and data security 2. Lack of Human Interaction 3. Accuracy and Trustworthiness 4. Limited Language Support	(Jackson, 2018; Ashfaq et al., 2020; Henderson et al., 2021; Pillai & Sivathanu, 2020; Melián-González et al., 2021; Fernandes & Oliveira, 2021; Mostafa &

	5. Unemployment Concerns 6. Ethical Considerations 7. Customer Service 8. Security and fraud detection issues 9. Helps customer on their purchasing experiences 10. Enhance existing jobs better and reduce repetitive tasks 11. Cybersecurity issue 12. Fraud issue 13. AI can help against Covid-19 pandemic 14. Help to make a better decision 15. Improve public service 16. People shopping behaviors changes	Kasamani, 2021; Rese et al., 2020; Malodia et al., 2022; Thomson, 2021; Weber & Schütte, 2019; Nadimpalli, 2017; Paramasivam, 2019; Cao, 2021; Di Vaio et al., 2020; Mikhaylov et al., 2018; Grewal et al., 2017; Belanche et al., 2019)
Technological	1. Enhance the shelf space. 2. Improve customer satisfaction 3. Helps in advertise products 4. Product Database and Real-Time Updates 5. Integration with E-commerce Platforms 6. Natural Language Generation 7. Tackling E-Commerce 8. Digitising Customer Expectations 9. Poor Customer Data 10. Multiple Security Risks 11. Lingering Supply Chain Issues 12. Not Having an Easy-To-Update E-commerce Platform 13. Limiting Solutions to Checkout Processes 14. Relying Too Heavily on Customer Agents 15. Failing to Deliver a Consistent Digital Experience 16. Inventory management and demand forecasting 17. Complexity 18. Helps to manage goods 19. Helps to reduce waste 20. Enhance in replenishment 21. Helps in fraud detection 22. Route optimization 23. Enhance warehouse management 24. Helps to fill supermarket shelves automatically 25. Automatic reading and interpretation the data 26. Reduce staff turnover rate 27. Helps in decision making 28. Enhance customers interactions 29. Enables to collect huge data and analyze more effectively 30. Improve data management 31. Staff can spend more time in customer services. 32. Improve warehouse operations efficiency. 33. Optimize and automate delivery service 34. Enhance transporting goods 35. Helps to make a smart marketing decision 36. Enable retailers to adjust price to maximize profits 37. Helps retailer to manage communication 38. Helps decide a new store location 39. Helps in automate cybersecurity management 40. Helps in fraud detection 41. Reduce error 42. Increase customer satisfaction	(Weber & Schütte, 2019; Przegalinska et al., 2019; Luo et al., 2019; Hoyer et al., 2020; Morosan, 2014; Chong et al., 2012; Pierdicca et al., 2015; Kahn et al., 2018; Chopra, 2019; Følstad et al., 2018; Thomson, 2021; Villarreal, 2022; Kyanon Digital Blog, 2021; Nadimpalli, 2017; Cao, 2021)
Environmental	1. Increased Energy Consumption 2. Overconsumption and Materialism 3. Sustainable Product Recommendations 4. Enhance environmental sustainability of products	(Berman, 2019; Pantano et al., 2017; Yang & Wu, 2009; Etemad-Sajadi, 2016; Kim et al., 2017; Jackson et al., 2014; Speicher et al., 2017; Frank, 2021)
Economic	1. Job Displacement 2. Skill Requirements and Training 3. Market Consolidation 4. Data Monopolies and Privacy Concerns 5. Economic Growth and Innovation 6. Price optimization and dynamic pricing 7. Growth of new business 8. Increase employee productivity 9. Impact on economics and business 10. Helps customer to make a right purchase decision 11. Boosting business sales and maximizing profits 12. Increase industry's levels of efficiency and production	(Kar et al., 2021; Caldarini et al., 2022; Malodia et al., 2022; Murtarelli et al., 2021; Christensen et al., 2020; Parasuraman & Colby, 2001; Lokanan, 2023; MIDA, 2020; Paramasivam, 2019; Dirican, 2015; Cao, 2021; Di Vaio et al., 2020; Weber & Schütte, 2019; Nadimpalli, 2017)

	13. Enhance business's cash flow 14. Improve sales opportunities 15. Reduce hiring costs	
Political	1. Regulatory Framework 2. Data Sovereignty 3. National Security 4. Digital Divide 5. AI tools are used in politics elections 6. Law and regulation of AI are used to assist decision makers	(Araujo, 2018; Weitz et al., 2019; Mayenberger, 2021; Barakat & Dabbous, 2019; Webb, 2018; Kane, 2019; Petit, 2017)
Value	1. Cultural Sensitivity 2. Bias and Discrimination 3. Ethical Consumption and Sustainability 4. Privacy and Consent 5. Transparency and Accountability 6. Improve people performance in their job position 7. Improve people's lives 8. Improve the quality of life	(Canhoto & Clear, 2020; Leszkiewicz et al., 2022; da Silva et al., 2021; Osborne Clarke Insights, 2021; Castillo et al., 2021; GIZ India, 2021; Chopra, 2019; Cao, 2021; Dhanabalan & Sathish, 2018)

The terms used to describe the issues and drivers were tabulated in the previous table. The next step was to combine and merge the key terms of issues and drivers that shared the same theme or a closely related theme into a single issue or driver. This research has identified 6 merged drivers which then develop in questionnaires for data collection purpose. All merged issues, challenges, and trends are shown in Table 3.3.

Table 3.3: Drivers Related to Merged Issues, Challenges, and Trends

No	Merged Issues and Drivers	Drivers
1.	• Improve customer satisfaction • Product Database and Real-Time Updates • Automatic reading and interpretation the data • Helps in decision making • Enhance customers interactions • Optimize and automate delivery service • Enhance transporting goods • Helps to make a smart marketing decision • Enable retailers to adjust price to maximize profits • Helps retailer to manage communication • Helps decide a new store location	Shorten the waiting time for customer perspective.
2.	• Improve people's lives • Improve the quality of life • Helps customer on their purchasing experiences • AI can help against Covid-19 pandemic • Help to make a better decision • Improve public service • People shopping behaviors changes • Improve customer satisfaction • Enhance customer interaction • Helps customer to make a right purchase decision • Increase customer satisfaction	Value creation of shopping experience.
3.	• Privacy and data security • Security and fraud detection issues • Cybersecurity issue • Fraud issue • Multiple security risks • Enables to collect huge data and analyze more effectively • Improve data management • Helps in automate cybersecurity management • Data monopolies and privacy concerns • Regulatory framework • Data sovereignty • National security • Privacy and consent	Data security and privacy concerns.

4.	• Enable retailers to adjust price to maximize profits • Economic growth and innovation • Price optimization and dynamic pricing • Increase industry's levels of efficiency and production • Reduce hiring cost	Cost saving of retail operation.
5.	• Accuracy and trustworthiness • Ethical considerations • Digitizing customer expectations • Reduce error • Growth of new business • Improve sales opportunities • Digital divide	Transparency and fairness.
6.	• Product database and Real-Time Updates • Helps in fraud detection • Bias and discrimination • Transparency and accountability	The algorithms of AI Virtual Assistant.

3. Research Methodology

Given Malaysia's relatively low connectivity in certain regions, particularly rural areas where internet infrastructure is still lagging, this study employed an exploratory research design grounded in foresight analysis (Faziharudean & Mitomo, 2006). A foresight process was used where it encapsulates five elements which are to scope the element, mobilizing its future, anticipating its future, recommending the future, and transforming the future (Popper, 2011). Each scope, mobilizing and anticipating, will play a huge role in the outcome of recommending and transforming as they would work together to evaluate the past to create an accurate forecast.

3.1. Foresight Process

It started with horizon scanning or sometimes also known as environmental scanning. It is a methodical technique that allows organizations to discover new patterns and critical turning points to strategically design favorable futures. Horizon scanning is the process of seeking verification of developing problems or patterns that may be of significance (Candy,2019). It is the early discovery and evaluation of innovative technologies or risks for policymakers in a chosen domain. It can be carried out by a handful of academics who exchange their ideas and expertise to evaluate how emerging technology may influence the future. The scope of horizon scanning would be 5 to 10 years of the past and future, and the data would be used to develop STEEPV analysis.

According to Grima et al. (2020), the STEEPV analysis is a risk evaluation and management technique that gives a knowledge of the environmental impact on the company and acts as a standard for decision-making. Grima et al. (2020) continued by saying that the organization would use the study's recommendations to construct a structured analysis that is pertinent to threats and dangers both present and future. Social, Technological, Economic, Environmental, Political, and Values (STEEPV) trends, difficulties, and challenges were identified. This analysis allows one to step back from their personal experiences and obtain a deeper grasp of several relevant elements that may influence their decision-making. In this study, the STEEPV analysis was done to identify future drivers of the use of AI-powered virtual shopping assistant among online retailers. The drivers would be converted into survey questions to determine their respective impact and future uncertainties.

Next, impact-uncertainty analysis was conducted. For the impact-uncertainty analysis, impacts mean the extent that each driver would influence the future of AI-powered virtual shopping assistant among Malaysian retailers, meanwhile uncertainty means the equivocal evolution of driver in AI-powered virtual shopping assistant among Malaysian retailers. The drivers with the highest impact and uncertainty are selected from the critical scenario area.

Impact		Low	Moderate	High
	High	Critical Planning Issues	Important Scenario Drivers	Critical Scenario Drivers
	Moderate	Important Planning Issues	Important Planning Issues	Important Scenario Drivers
	Low	Monitor	Monitor	Monitor & Reassess

Uncertainty

Fig. 2.0: Impact-Uncertainty Matrix

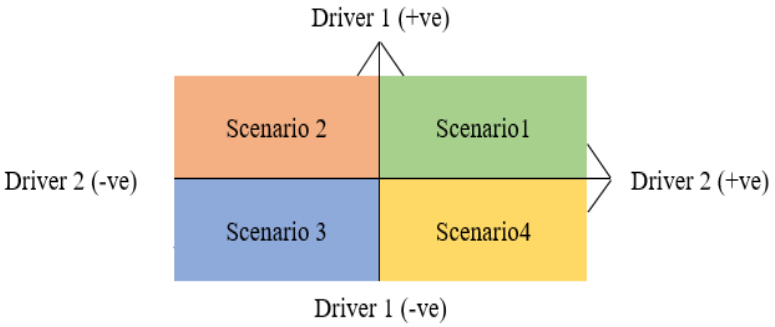

Fig. 2.1: Discussion on The Future Scenarios

Lastly, future scenarios would be discussed. Scenario writing shows a clear vision of situation in the future. In this research, the scenario development is used to produce four different future events of the AI-powered virtual shopping assistant among Malaysian retailers through top two drivers of the impact and uncertainty analysis. There would be four alternative scenarios that can delivery future vision that would occur in the next 5 to 10 years.

3.2. Population and Sampling

According to Pritha Bhandari (2020), a population is a total group about whom you want to conclude, and it does not always have to do with humans. It may refer to a collection of items from whatever you are studying, such as objects, events, organisations, countries, species, organisms, and so on. Since it is not feasible to study the entire population, sampling is commonly employed. There are two major types of sampling which are probability and non-probability sampling. Probability sampling involves a random selection of respondents while non-probability sampling involves a non-random selection of respondents. In this study, purposive sampling, a type of non-probability sampling was used since the sampling frame is unknown, and the targeted respondents must meet specific criteria such as participants must have experienced and heard about AI-powered virtual assistant services.

This study used the sampling frame of online retailers in Malaysia who use websites like Shopee and Lazada. Since the population of active sellers is not publicly known and changes over time, it was considered large and indeterminate. Applying the Krejcie and Morgan (1970) rule of thumb a minimum of 384 respondents would be necessary to give a 95% confidence rate with a margin of error of 5%. The current research, however, achieved a low 33 respondents. This limitation has been recognised, however, the study is exploratory and prospective instead of confirmatory or hypothesis-testing. The sample is therefore placed as a pilot study whose main purpose is to identify relevant drivers and to test the research instrument. In literature, pilot studies indicate that at least 12 participants per group (Julious, 2005) or 30 participants in total (Hertzog, 2008) are enough to produce some preliminarily estimates of parameters to be used in the larger studies. Thus, the present results are to be believed as a form of pre-emptive foresight, and follow-up research is to be encouraged to enlarge the sample to guarantee sufficient statistical power.

3.3. Research Instrument

The research instrument is defined as a tool for collecting, measuring, and analysing data linked to the issue. A

questionnaire is utilised as a research tool in this quantitative investigation. The questionnaire is broken into four sections, which are A, B, C, and D. Section A would go over participant demographics such as sexual orientation, age, and questions based on adoption of AI. Meanwhile, Section B discussed the drivers based on the STEEPV analysis and indicated the driver's impact in relation to the issue. Section C discussed the uncertainty of the drivers and section D discussed the Technology Readiness Index (TRI) of using virtual assistant on shopping among online retailers.

Table 2: Structure of the questionnaire

Section	Content
Section A	Respondent's demographic
Section B	The impact of using virtual assistant on shopping among online retailers.
Section C	The uncertainty of using virtual assistant on shopping among online retailers.
Section D	The Technology Readiness Index (TRI) of using virtual assistant on shopping among online retailers.

The collected survey was analysed descriptively. In this study, Microsoft Excel was used as primary tool for the analysis involving mean analyses and plotting impact and uncertainty.

4 Result

The impact-uncertainty analysis was done using Microsoft Excel. The data collection was completed through a questionnaire survey with 33 respondents from online retailers in Malaysia such as Shopee and Lazada platform.

4.1. Demographic Analysis

Throughout the data collection process, the questionnaire was distributed to around 60 online retailers through an online shopping platform, however, the researcher received approximately 33 valid and filled-out questionnaires. All the questionnaires were distributed via Shopee and Lazada. The survey response rate for this study was 55.0 %.

The analysis reported that majority of the respondents were female which consists of 18 people (54.5%) and the rest 45.5% (15) is male. Most of the respondent's is aged between 25-34 which is 13 (39.4%). Besides, there were 28 respondents (84.8%) that have heard about AI virtual assistant in shopping while 5 (15.2%) other respondents have not heard about AI virtual assistant in shopping. 81.8% of the respondents (27) have implemented AI virtual assistant in shopping as retailers while 6 (18.2%) other respondents have not implemented yet.

In addition, the highest number of respondents were 12 (36.4%) which they have been using AI virtual assistant in their platform for months while 6 (18.2%) other respondents were not using AI virtual assistant yet in their platform. There were 28 respondents (84.8%) that think AI virtual assistant in shopping would be useful in the future while 5 (15.2%) other respondents were think AI virtual assistant in shopping would not be useful in the future.

4.2. Impact-Uncertainty Analysis

Table 4: Mean score of Impact and Uncertainty drivers

Code	Drivers	Mean	
		Impact	**Uncertainty**
D1	Shorten the waiting time for customer perspect.	3.72727	3.66666
D2	Value creation of shopping experience.	3.70707	3.62626
D3	Data security and privacy concerns.	3.96969	3.69696
D4	Cost saving of retail operation.	3.75757	3.66666
D5	Transparency and fairness.	3.60606	3.45454
D6	The algorithms of AI Virtual Assistant.	3.69696	3.72727

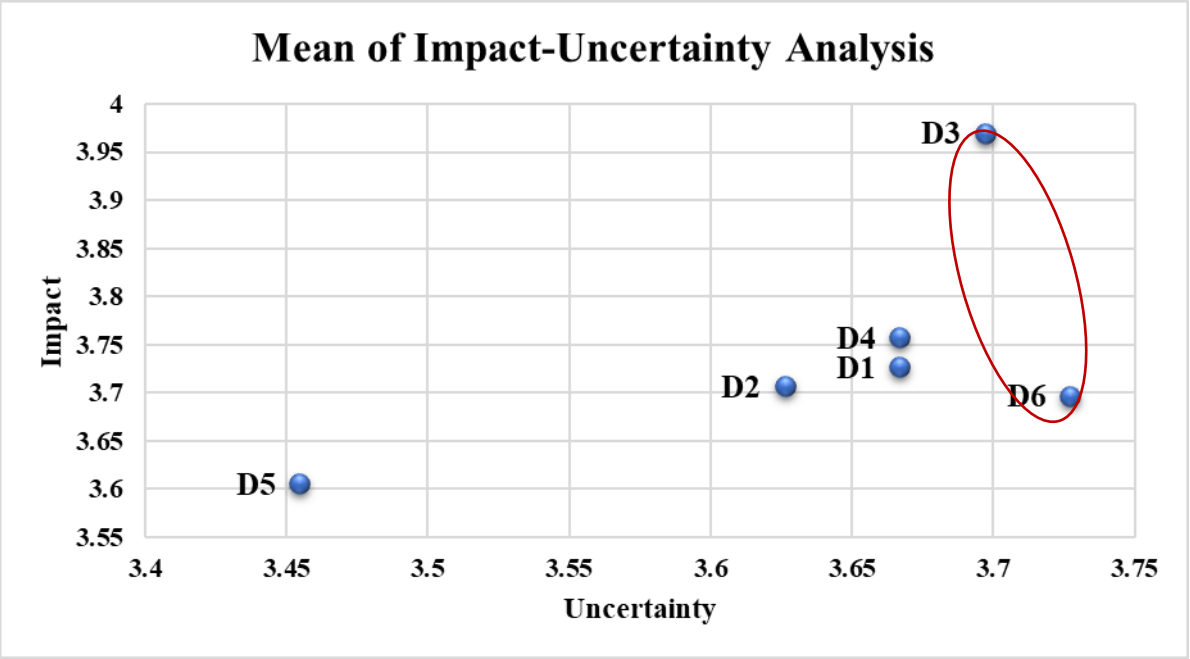

Fig. 4: Mean score of Impact and Uncertainty Drivers

The mean value has been obtained for both the level of impact and uncertainty. Before doing the impact-uncertainty analysis, Table 4.1 was created to clearly illustrate the difference in mean in the two aspects. The drivers with greatest impacts and uncertainty in the future were determined by using the data in Table 4.1 to develop an impact-uncertainty analysis. Figure 4 displays the analysis's findings. One red circle would indicate the top two drivers with the greatest impact and uncertainty. Since D6 is the driver with the highest level of uncertainty and D3 has the largest level of impact, the coordinates of D3 (3.69, 3.96) and D6 (3.72, 3.69) were chosen. It represents two drivers of the 'Data security and privacy concerns' and the 'The algorithms of AI Virtual Assistant' respectively. These two key drivers would use to generate the scenario-building analysis.

4.3. Technology Readiness Index (TRI) Analysis

Table 4.1: Overall Technology Readiness Index (TRI) of Artificial Intelligence (AI)

Attributes	**Mean**	**Central of Tendency Level**
Optimism	3.69696	High
Innovativeness	3.72727	High
Discomfort	3.75000	High
Insecurity	3.70454	High
Overall TRI	**3.71967**	**High**

Based on the table above, discomfort has the highest mean score among the four attributes which is 3.75000. The second highest mean score is innovativeness (3.72727), followed by insecurity (3.70454). Optimism is the lowest mean score which is 3.69696. The central tendency of these four characteristics is high overall. Consequently, Malaysian retailers' level of AI technology readiness was at the higher end of the central tendency scale.

The results of data gathering are discussed, including the mean score for each driver and the TRI score, which were produced entirely using Microsoft Excel. The respondents' general characteristics were revealed by demographic analysis. The drivers that have been shown to have the greatest potential impact and uncertainty for AI-powered virtual shopping assistant among Malaysian retailers are all listed below. Finding the most important top of the two drivers is the outcome of an impact-uncertainty study. In the next step, drivers "D3" and "D6" were combined to provide a scenario building analysis for AI-powered virtual shopping assistant among Malaysian retailers.

5 Discussion, Recommendation and Conclusion

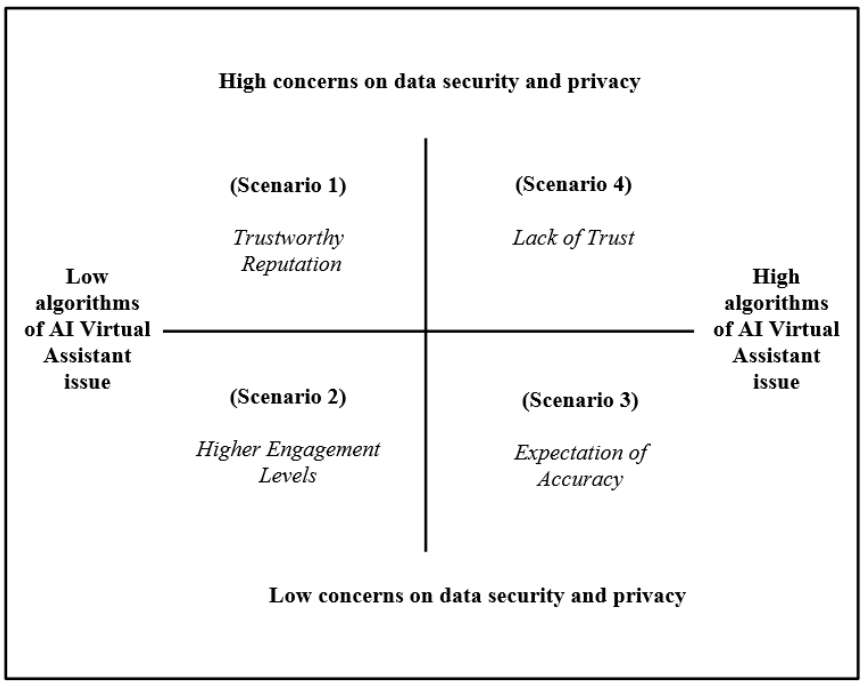

Fig. 5: Future Scenario of AI-Powered Virtual Shopping Assistant Among Malaysian Retailers

Figure 5 displays the four potential scenarios that were calculated using the impact-uncertainty analysis. Furthermore, the top two drivers chosen were used to create the four alternative scenarios, which are “Data Security and Privacy Concerns” and “The Algorithms of AI Virtual Assistant.”

5.1.1. Scenario 1: Trustworthy Reputation

The first scenario is when there are high concerns about data security and privacy, but there are also only minor problems with the virtual shopping assistants' algorithms. This scenario shows on trustworthy reputation of its online retail that suggests a situation where the platform places a significant emphasis on protecting user data while maintaining an impressive performance in terms of algorithmic functionality. Here, the online retailer will use an AI virtual shopping assistant after putting strong and strict safeguards in place to protect user data privacy. For example, as we know that the AI technology utilized by the global e-commerce company, Amazon in its online activities is a "combination of machine learning, computer vision, and cameras" (Foya 1921). Users can now take advantage of personalized recommendations without revealing personally identifiable information directly. Accurate and instinctive recommendations are what customers interacting with the virtual shopping assistant will experience. The algorithms efficiently use consumer data to comprehend preferences, making for a tailored and effective shopping experience. According to Foya (2021) the system would track customers' movements throughout the store and forward purchase details to their smartphone. In conclusion in this scenario, "Trustworthy Reputation" is the best out of the three other scenario, with high concerns about data security and privacy and low issues with virtual shopping assistant algorithms, indicating a dedication to protecting user data while providing a satisfying and customized user experience. For the future, if Malaysia’s online retailer in an increasingly data-sensitive environment, this combination is beneficial in establishing and preserving customer trust with developing AI virtual shopping assistant.

5.1.2. Scenario 2: Higher Engagement Levels

Higher levels of engagement happen when low levels of privacy and data security concerns are related to low levels of AI virtual assistant issues. In scenario 2, the situation developed when it encourages an atmosphere in which customers are typically willing to provide personal data in exchange for enhanced customization. For their own private interests, some customers are okay with their data being shared. According to Uebernickel, Brenner, Petrie, and Stermann (2016), a company's ability to grow depends on its ability to implement a global customer-centric strategy that puts the needs of its customers first. Consumers may interact with the virtual shopping assistant more frequently, expecting it to recognize their preferences and make suggestions that are related to them. Because of this, businesses frequently use artificial intelligence (AI), an emerging technology, to track real-time data, analyze it, and respond swiftly to customer needs (Wirth, 2018). Through the use of customer data, virtual shopping assistants can improve the user experience by

suggesting products, delivering appropriate information, and providing simple exploration within the online retail store. In summary, businesses can take advantage of the chance to provide highly personalized and interesting shopping experiences in the future with implementing AI virtual assistant in Malaysia online retailer, in a setting where customers have low concerns about data security and privacy and minimal issues with virtual shopping assistant algorithms. The secret is to keep transparency and give users control over their data while optimizing AI algorithms for efficient personalization. Customers who are open to sharing information can benefit from a positive and customized shopping experience when using this approach.

5.1.3. Scenario 3: Expectation of Accuracy

In scenario 3, the scenario shows expectation of accuracy will occur when there are low concerns on data security and privacy but perceive high issues with the algorithms of AI virtual shopping assistants. The expectation of accuracy in this case means that, although there are issues with the AI virtual assistant's algorithms, users may be more willing to share information and still expect the AI virtual shopping assistant to make relevant and accurate recommendations. According to Avizienis et al. (2004), the main causes of dependability challenges are errors, failures, and flaws. Customers, on the other hand, have high expectations that the algorithms used by the virtual shopping assistant will function well in delivering related and accurate recommendations. A machine learning system aims to enhance its behavior through experience (Mitchell, 2006). With the adoption of AI virtual shopping assistant, online retailers can thus implement features that enable users to fine-tune and customize their preferences. This gives customers the ability to improve the accuracy of the recommendations they receive in addition to offering a more customized experience. Artificial intelligence (AI) tools are useful for figuring out what customers want and potential futures (Shabbir, 2015). In conclusion of this scenario, online retail in Malaysia that have low concerns about data privacy but perceive high algorithmic of AI virtual assistant issues, transparency, user education, and algorithmic optimization must be given top priority by the virtual shopping assistant. The virtual shopping assistant needs to be developed so it can meet the expectations of users who value algorithmic performance and data-driven personalization in the future by improving its accuracy and relevance through continuous algorithmic improvement and user participation.

5.1.4. Scenario 4: Lack of Trust

The last scenario, lack of trust will occur when there is high concern on data security and privacy and simultaneously high issues with the algorithms of AI virtual shopping assistants, it presents a demanding situation that must be carefully considered in order to reduce those concerns. Customers may find it difficult to trust the virtual shopping assistant to manage their data appropriately and provide related and accurate recommendations. Customers also will be scared to buy from the online retail store because of hesitation towards the retailer. This might result in lower customer satisfaction, which might result in fewer customers, which would undoubtedly have an impact on your revenue and the stability of your company. (Pusey, 2021). The algorithms of AI virtual shopping assistant issues are high is very crucial among retailers to keep tight with the customer satisfaction to avoid frustration on them. A study conducted by the Capgemini Research Institute predicted that by 2023, artificial intelligence would save the retail sector about $340 billion yearly. Privacy-first design can be applied to virtual shopping assistants. Customer trust can be gradually increased by limiting the collection of pointless personal data, removing information, and guaranteeing compliance with privacy regulations. The K-Means algorithm, according to Stuart L. (1957), separates data into clusters, with each data point belonging to the cluster with the closest mean. Retailers utilize K-Means as a tool for customer segmentation. Using the K-Means algorithm, retailers can also identify products that are frequently bought together. Retailers can then use the data to optimize store layouts and increase cross-sell rates (Stuart L, 1957). In conclusion, if Malaysian online retailers addressing the concerns of customers with high data security and privacy apprehensions and high level on algorithmic of AI virtual shopping assistant issues requires a multi-faceted approach. Virtual shopping assistants can strive to rebuild customer trust and create a more positive and secure shopping experience by emphasizing privacy-centric design, user control, transparency, and continuous improvement in the future.

5.2 Limitation

Although this research offers valuable information regarding the possible contributors and the possible future of AI-driven virtual shopping assistants among Malaysian retailers, it is important to note several limitations to this study. To begin with, the research involved a small sample of 33 respondents. Although this figure is in line with recommendations of pilot studies (Julius, 2005; Hertzog, 2008), it is less than the sample size necessary to conduct generalisable hypothesis testing, which in the case of large population is 384 respondents suggested by Krejcie and Morgan (1970). Consequently, results should be seen as initial and descriptive, providing futuristically minded evidence instead of statistically generalisable findings. Second, the research was based on self-reported perceptions of online retailers on websites like

Shopee and Lazada, which could also be subjected to biases in terms of personal experience, awareness, or information disclosure. Third, e-commerce in Malaysia is dynamic, hence, drivers and scenarios determined can change swiftly in response to shifts in consumer behaviour, technological progress and regulatory frameworks.

5.3 Recommendation

This research's main purpose was to determine the major future drivers and potential applications of artificial intelligence in Malaysia's online retail sector. Furthermore, a great emphasis is placed on choosing respondents who can share their points of view on the impact and uncertainties that would significantly affect the study's conclusion. Further studies are thus advised to increase the sample size with probability-based sampling, as well as employ power analysis (Cohen, 1992; Faul et al., 2009) to achieve sufficient statistical validity. This way, the foresight scenarios as put forward in this paper can be validated and built upon in future studies, leading to stronger and more generalisable findings across researchers and practitioners.To ensure that the results are more accurately to identify the views on the future potential customers of the specified businesses as perceived by the population and even Malaysians as a whole, the researcher should also take into consideration the diverse cultural backgrounds within the state, society, and personal background.

5.4 Conclusion

The aim of this study was to establish the most important drivers and possible future scenarios in the application of AI-powered virtual shopping assistants by Malaysian online retailers. Through a combined foresight analysis system, including horizon scanning, STEEPV analysis, impact-uncertainty analysis, the Technology Readiness Index (TRI), and scenario building, the study conducted a systematic exploration of potential paths of adoption. Six combined drivers were found, and the most influential ones were the issues of data security and privacy, as well as the AI virtual assistant algorithms. These two drivers informed the creation of four alternative scenarios that demonstrate the possible future of enhanced customer trust to reduced trust in virtual assistants. The paper shows that foresight analysis is a systematic and rigorous method that can be used to predict the changes in technology and its effects. The findings also indicate chances and threats of AI adoption to Malaysian retailers, as innovation and data safety should be balanced, and the use of algorithms must be transparent and trustworthy to customers. The resulting scenarios provide a basis on which strategic planning can be undertaken to provide guidance to retailers, policymakers, and other stakeholders to navigate to the uncertain but promising future of AI-powered retail.

References

25 amazing omnichannel marketing statistics every marketer should know (updated for 2021).25 Amazing Omnichannel Statistics for Marketers |. (1970, June 29). https://porchgroupmedia.com/blog/25-amazing-omnichannel-statistics-every-marketer-should-know/

Adam, M., Wessel, M., Benlian, A., 2021. AI-based chatbots in customer service and their effects on user compliance. Electron. Mark. 31 (2), 427–445.

Adapa, S., Fazal-e-Hasan, S.M., Makam, S.B., Azeem, M.M., Mortimer, G., 2020. Examining the antecedents and consequences of perceived shopping value through smart retail technology. J. Retailing Consum. Serv. 52, 101901. https://doi.org/10.1016/j.jretconser.2019.101901.

Afshar, V. (2021, April 7). *AI-powered virtual assistants and the future of work*. ZDNET. https://www.zdnet.com/article/ai-powered-virtual-assistants-and-future-of-work/

Amershi, S., Begel, A., Bird, C., DeLine, R., Gall, H., Kamar, E., Nagappan, N., Nushi, B., Zimmermann, T., 2019. Software engineering for machine learning: A case study. In: 2019 IEEE/ACM 41st International Conference on Software Engineering: Software Engineering in Practice (ICSE-SEIP). IEEE, pp. 291–300.

Araujo, T. (2018). Living up to the chatbot hype: The influence of anthropomorphic design cues and communicative agency framing on conversational agent and company perceptions. Computers in Human Behavior, 85, 183–189.

Ashfaq, M., Yun, J., Yu, S. & Loureiro, S.M.C. (2020). I, Chatbot: Perceived anthropomorphism of AI-enabled chatbots and their impact on consumer's attitude and purchase intention. International Journal of Retail & Distribution Management, 48(11), 1215–1233.

Avizienis, A., Laprie, J.-C., Randell, B., Landwehr, C., 2004. Basic concepts and taxonomy of dependable and secure computing. IEEE Trans. Dependable Secure Comput. 1 (1), 11–33.

Balakrishnan, J., Dwivedi, Y.K., Hughes, L., Roy, F., 2023. Enablers and inhibitors of AI- powered voice assistants: a dual-factor approach by integrating the status quo bias and technology acceptance model. Inf. Syst. Front. https://doi.org/10.1007/s10796-021-10203-y (in press).

Barakat, K.A. & Dabbous, A. (2019). Virtual assistants: From marketing novelty to a consumer necessity. Journal of Retailing and Consumer Services, 50, 258–268.

Belanche, D., Casaló, L.V. & Flavián, C. (2019). Artificial intelligence in fintech: Understanding robo-advisors adoption among customers. Industrial Management & Data Systems, 119(7), 1411–1430.

Berman, S.J. (2019). The AI-powered enterprise: Harnessing the potential of AI at scale. Strategy & Leadership, 47(1), 3–9.

C. Zerbini, T.H. Bijmolt, S. Maestripieri, B. Luceri, Drivers of consumer adoption of e-Commerce: a meta-analysis, Int. J. Res. Mark. 39 (4) (2022) 1186-1208.

Candy, S. (2019). Futures Foresight and Horizon Scanning. In A. Poli (Ed.), Handbook of Anticipation (pp. 1–26).

Canhoto, A. & Clear, F. (2020). Artificial intelligence and machine learning in marketing management: Implications for theory and practice. Journal of Business Research, 116, 186–195.

Cao, L. (2021). AI in commerce: Applications, challenges and opportunities. Electronic Markets, 31(3), 1–20.

Cao, L. (2021). Artificial intelligence in retail: Applications and value creation logics. *International Journal of Retail & Distribution Management.*

Castillo, C., Mendoza, M. & Poblete, B. (2021). Predicting information credibility in time-sensitive social media. Internet Research, 31(2), 447–466.

Chebat, J., Michon, R., Haj-salem, N., Oliveira, S., 2014. Journal of Retailing and Consumer Services the effects of mall renovation on shopping values , satisfaction and spending behaviour. J. Retailing Consum. Serv. 21, 610–618. https://doi.org/ 10.1016/j.jretconser.2014.04.010.

Chen, L.-D., Tan, J., 2004. Technology adaptation in E-commerce. Eur. Manag. J. 22, 74–86. https://doi.org/10.1016/j.emj.2003.11.014.

Chin, Z. K. (2024). Factors influencing the intention to adopt artificial intelligence in the Malaysian retail industry (Bachelor's thesis). Universiti Tunku Abdul Rahman, Malaysia. Retrieved from https://eprints.utar.edu.my/6703/

Chong, A.Y.L., Chan, F.T.S. & Ooi, K.B. (2012). Predicting consumer decisions to adopt mobile commerce: Cross country empirical examination. Decision Support Systems, 53(1), 34–43.

Chopra, K. (2019). Indian shopper motivation to use artificial intelligence. *International Journal of Retail & Distribution Management, 47*(3), 331-347.

Chopra, T. (2019). The role of AI in human resource management: An empirical study. Human Resource Management International Digest, 27(3), 34–38.

Christensen, L.T., Murtarelli, G. & Shadnam, M. (2020). Corporate communication and artificial intelligence: Towards a research agenda. Public Relations Inquiry, 9(2), 233–251.

Cohen, J. (1992). A power primer. Psychological Bulletin, 112(1), 155–159. PubMedwww2.psych.ubc.catqmp.org

D.J. Kim, M.S. Yim, V. Sugumaran, H.R. Rao, Web assurance seal services, trust and consumers' concerns: an investigation of e-commerce transaction intentions across two nations, Eur. J. Inf. Syst. 25 (2016) 252-273.

Da Silva, J., Luz, C. & Pessôa, F. (2021). Ethical challenges of artificial intelligence in consumer markets. Journal of Business Ethics, 170(2), 219–232.

DC, R. (2023, November 29). *25 reasons why customers abandon their shopping carts and techniques to reduce cart abandonment*. crowdspring Blog. https://www.crowdspring.com/blog/shopping-cart-abandonment/

Deloitte, 2019. Chat, Talk, Touch...That's how companies interact with their customers. Available at. https://www2.deloitte.com/content/dam/Deloitte/de/Documents/fin ancial-services/deloitte-survey-chat-talk-touch.pdf.

Dhanabalan, T. & Sathish, A. (2018). Transforming Indian industries through artificial intelligence and robotics in Industry 4.0. International Journal of Mechanical Engineering and Technology, 9(10), 835–845.

Di Vaio, A., Boccia, F., Landriani, L., & Palladino, R. (2020). Artificial intelligence in the agri-food system: Rethinking sustainable business models in the COVID- 19 scenario. *Sustainability (Switzerland),* 12(12), 1-12.

Dirican, C. (2015). The Impacts of Robotics, Artificial Intelligence on Business and Economics. *Procedia - Social and Behavioral Sciences, 195, 564–573.*

Duan, Y., Edwards, J.S., Dwivedi, Y.K., 2019. Artificial intelligence for decision making in the era of Big Data – evolution, challenges and research agenda. Int. J. Inf. Manag. 48, 63–71. https://doi.org/10.1016/j.ijinfomgt.2019.01.021.

E. Colla, P. Lapoule, E-commerce: exploring the critical success factors, Int. J. Retail Distrib. Manag. 40 (11) (2012) 842-864.

Emma. (2023, November 28). *Future of Online Shopping: Personalized assistance with chatgpt*. PixelCrayons. https://www.pixelcrayons.com/blog/digital-transformation/future-online-shopping-personalized-chatgpt-assistance/

Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2009). Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. Behavior Research Methods, 41(4), 1149–1160. SpringerLinkSCIRPResearchGate

Faziharudean, T.M. and Mitomo, H., 2006. Digital Divide among Public Servants in Malaysia: Urban-rural differences in valuing Internet use. *Studies in Regional Science*, 35(4), pp.837–849.

Fernandes, T. & Oliveira, E. (2021). Understanding consumer acceptance of AI-enabled services in retailing: Evidence from chatbots. Journal of Retailing and Consumer Services, 62, 102607.

Følstad, A., Nordheim, C.B. & Bjørkli, C.A. (2018). What makes users trust a chatbot for customer service? An exploratory interview study. International Journal of Human–Computer Studies, 119, 38–52.

Foya, E. E. (2021). Analysis and study Artificial Intelligence to improve Inventory management.

Frank, A.G. (2021). Sustainability through AI: Integrating circular economy principles in production and consumption. Journal of Cleaner Production, 293, 126–155.

Frank, B. (2021). Artificial intelligence-enabled environmental sustainability of products: Marketing benefits and their variation by consumer, location, and product types. *Journal of Cleaner Production.* 285, 1-11.

G. Antoniou, L. Batten, E-commerce: protecting purchaser privacy to enforce trust, Electr. Commerce Res. 11 (4) (2011) 421-456.

Gans, J. S. (2016). Keep calm and manage disruption. MIT Sloan Management Review, 57(3), 83. Jain, S., & Gandhi, A. V. (2021). Impact of artificial intelligence on impulse buying behaviour of Indian shoppers in fashion retail outlets. International Journal of Innovation Science, 13(2), 193–204.

GIZ India (2021). Artificial intelligence: Ethics and governance report. New Delhi: Deutsche Gesellschaft für Internationale Zusammenarbeit.

Grewal, D., Roggeveen, A.L. & Nordfält, J. (2017). The future of retailing. Journal of Retailing, 93(2), 135–140.

Grima, S., Özen, E., & Boz, H. (2020). A STEEPV analysis of the current and future state of the financial services industry. European Research Studies Journal, 23(Special Issue 1), 199–217.
Henderson, C.M., et al. (2021). Customer avoidance of AI in services: The role of trust and perceived risk. Journal of Service Research, 24(2), 234–250.
Hertzog, M.A. (2008). Considerations in determining sample size for pilot studies. Research in Nursing & Health, 31(2), 180–191.
Hoyer, W.D., Kroschke, M., Schmitt, B., Kraume, K. & Shankar, V. (2020). Transforming the customer experience through new technologies. Journal of Interactive Marketing, 51, 57–71.
Jackson, P. (2018). Introduction to Artificial Intelligence. 4th ed. Dover Publications.
Jackson, V., Stoel, L. & Brantley, A. (2014). Self-service technologies in retail: A study of customer perceptions. International Journal of Retail & Distribution Management, 42(8), 720–735.
Jain, S., & Gandhi, A. V. (2021). Impact of artificial intelligence on impulse buying behaviour of Indian shoppers in fashion retail outlets. International Journal of Innovation Science, 13(2), 193–204.
Julious, S.A. (2005). Sample size of 12 per group rule of thumb for a pilot study. Pharmaceutical Statistics, 4(4), 287–291.
Kahn, B.E., Inman, J.J. & Verhoef, P.C. (2018). Introduction to the special issue: Retailing in a connected world. Journal of Retailing, 94(4), v–viii.
Kane, T. B. (2019). Artificial Intelligence in Politics: Establishing Ethics. IEEE Technology and Society Magazine, 38(1), 72–80.
Kar, A.K., Ilavarasan, P.V. & Gupta, M.P. (2021). Assessing the role of AI-based virtual assistants in organizations. Information Systems Frontiers, 23(5), 1343–1361.
Kim, J., Kim, S. & Kim, S. (2017). The impact of smart technologies on retail customer experience. Journal of Retailing and Consumer Services, 37, 362–368.
Kimberly, W., 2016. How artificial intelligence is changing the retail experience for consumers [WWW Document]. URL. https://www.forbes.com/sites/kimberlywhitler/2016/12/01/how-artificial-intelligence-is-changing-the-retail-experience-for-consumers/#5d75cbd01008.
Kisling, D. (2022, November 7). How AI transforms retail in 2022: Virtual Shopping assistants. Best practices for Conversational AI: chatbots, voice bots, call bots by Tovie AI. https://tovie.ai/blog/how-ai-transforming-physical-retail-in-2022
Kisling, D. (2023, October 11). How AI transforms retail in 2023: Virtual shopping assistants. Tovie AI: Generative AI and on-prem LLM for Enterprise. https://tovie.ai/blog/how-ai-transforming-physical-retail-in-2023
Koan Advisory and Digital India Foundation, 2021. Handbook on data protection and privacy for developers of artificial intelligence (AI) in India. Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH. https://www.dsci.in/sites/default/files/documents/resource_centre/AI%20Handbook.pdf.
Koumanakos, D. P. (2008). The effect of inventory management on firm performance. International Journal of Productivity and Performance Management, 57(5), 355–369. https://doi.org/10.1108/17410400810881827.
Krejcie, R.V. & Morgan, D.W. (1970). Determining sample size for research activities. Educational and Psychological Measurement, 30(3), 607–610. SAGE Journals+1
Kyanon Digital Blog. (2021). AI in retail: Inventory management and demand forecasting. Available at: https://kyanon.digital/blog/ [Accessed 29 Aug 2025].
Leszkiewicz, A., et al. (2022). Fairness and bias in AI algorithms: An empirical study. AI & Society, 37(2), 343–355.
Liu, L., Zhou, B., Zou, Z., Yeh, S. C., & Zheng, L. (2018). A smart unstaffed retail shop based on artificial intelligence and IoT. In 2018 IEEE 23rd International workshop on computer aided modeling and design of communication links and networks (CAMAD), 1-4.
Lokanan, M. (2023, January 28). The impact of artificial intelligence on the retail industry. SegWitz. https://segwitz.com/the-impact-of-artificial-intelligence-on-the-retail-industry/
Lokanan, M.E. (2023). Dynamic pricing and fairness perceptions in e-commerce. Journal of Retailing and Consumer Services, 70, 103191.
Luo, X., Tong, S., Fang, Z. & Qu, Z. (2019). Frontiers: Machines vs. humans: The impact of AI chatbots on consumer purchase. Marketing Science, 38(6), 937–947.
Mayenberger, D. (2021). Data sovereignty and consumer trust in AI. Telecommunications Policy, 45(7), 102155.
Melián-González, S., Bulchand-Gidumal, J. & López-Valcárcel, B.G. (2021). Virtual assistants in hospitality: The role of trust and service quality. Tourism Management, 85, 104301.
Mikhaylov, S.J., Esteve, M. & Campion, A. (2018). Artificial intelligence for the public sector: Opportunities and challenges. Philosophy & Technology, 31(4), 611–627.
Mitchell, T.M., 2006. The Discipline of Machine Learning, vol. 9. Carnegie Mellon University, School of Computer Science, Machine Learning Department.
Moore, S. (2018, January 18). 4 steps to overcome data quality challenges. Gartner. https://www.gartner.com/smarterwithgartner/how-to-stop-data-quality-undermining-your-business
Morosan, C. (2014). Toward an integrated model of adoption of mobile phones for purchasing hotel services. International Journal of Hospitality Management, 42, 125–133.
Mortenson, J., 2022. Why is AI so expensive for business? https://www.techevaluate.com/why-is-ai-so-expensive-for-business/
Mostafa, M.M. & Kasamani, T. (2021). Consumer rejection of humanlike chatbots: An emerging paradox. Journal of Business Research, 132, 600–609.
Murtarelli, G., Romenti, S. & Valentini, C. (2021). The dark side of AI: Challenges for communication management. Corporate Communications: An International Journal, 26(2), 255–271.
Mustapic, B. (2022, August 25). What is a virtual shopping assistant? Shogun. https://getshogun.com/learn/virtual-shopping-assistants/
Nadimpalli, M. (2017). Artificial intelligence risks and benefits. International Journal of Computer Applications, 162(9), 31–33.
Nannan Xi, Highlights•This study systematically reviews a body of 72 research papers (83 studies) that investigated VR retail.•The results are further analyzed from 51 experiment-based empirical studies.•Sixteen future research avenues related conceptual, & AbstractVirtual reality (VR) refers to technologies for substituting the perceived reality. With the recent proliferation of consumer-

grade head-mounted VR displays. (2021, May 26). Shopping in virtual reality: A literature review and future agenda. Journal of Business Research. https://www.sciencedirect.com/science/article/pii/S0148296321003209

Osborne Clarke Insights, 2021. Virtual voice assistants' challenge to comply with data protection legislation. https://www.osborneclarke.com/insights/virtual-voice-assistants-challenge-comply-data-protection-legislation

Pallathadka, H., Ramirez-Asis, E. H., Loli-Poma, T. P., Kaliyaperumal, K., Ventayen,

Panigrahi, D., & Karuna, M. (2021). A Review on Leveraging Artificial Intelligence to Enhance Business Engagement in Ecommerce. International Journal of Research Publication and Reviews, 2(6), 239-250.

Pantano, E., Priporas, C.V. & Migliano, G. (2017). Reshaping traditional retailing: The impact of technology on consumer experience. Journal of Retailing and Consumer Services, 37, 107–113.

Parasuraman, A. & Colby, C.L. (2001). Techno-ready marketing: How and why your customers adopt technology. Free Press.

Person, ImageObject, & 96. (2022, May 6). How bad data impacts customer experience. Gravy Analytics. https://gravyanalytics.com/blog/how-bad-data-impacts-customer-experience/

Petit, N. (2017). Law and regulation of artificial intelligence and robots. SSRN Electronic Journal. doi:10.2139/ssrn.2931339

Pillai, R. & Sivathanu, B. (2020). Adoption of AI-based chatbots for hospitality and tourism. International Journal of Contemporary Hospitality Management, 32(11), 3199–3216.

Plesea, A. (2022, October 26). 5 benefits of AI-powered virtual assistants across the retail industry. Build and deploy conversational AI solutions easily - DRUID AI. https://www.druidai.com/blog/5-benefits-of-ai-powered-virtual-assistants-across-the-retail-industry

Popper, R. (2011). Foresight methodology. In J. C. Glenn & T. J. Gordon (Eds.), Futures Research Methodology – Version 3.0 (pp. 1–47).

Przegalinska, A., Ciechanowski, L., Stroz, A., Gloor, P. & Mazurek, G. (2019). In bot we trust: A new methodology of chatbot performance measures. Business Horizons, 62(6), 785–797.

Pusey, S. (2021, January 6). The real cost of not managing poor performance in your business. The Curve Group - Recruitment & HR Specialists., from https://www.thecurvegroup.co.uk/the-real-cost-of-not-managing-poor-performance-in-your-business/

PwC Report, n.d.PwC Report, (n.d). Consumer intelligence series: Prepare for the voice revolution, available at https://www.pwc.com/us/en/advisoryservices/publications/consumer-intelligence-series/voice-assistants.pdf.

R. J., & Naved, M. (2021). Applications of artificial intelligence in business management, e-commerce and Finance. Materials Today: Proceedings. https://doi.org/10.1016/j.matpr.2021.06.419

Rajasshrie Pillai a, a, b, c, AbstractArtificial Intelligence (AI) is transforming the way retail stores operate. AI-Powered Automated Retail Stores are the next revolution in physical retail. Consumers are facing fully automated technology in these retail stores. Therefore, Adapa, S., Agrebi, S., Aladwani, A. M., Bauer, C., Berman, B., Bruner, G. C., Bulmer, S., Chebat, J., Chen, L.-D., Chen, Y. M., Chiu, H. C., Chong, A. Y. L., Chung, N., Demirkan, H., … Buyle, R. (2020, August 4). Shopping intention at AI-Powered Automated Retail Stores (AIPARS). Journal of Retailing and Consumer Services. https://www.sciencedirect.com/science/article/pii/S0969698919302887?ref=cra_js_challenge&fr=RR-1

Rajnerowicz, K. (2022, December 15). Beginner's Guide to Virtual Shopping Assistants & Bots. Tidio. https://www.tidio.com/blog/virtual-shopping-assistant/

Rese, A., Ganster, L. & Baier, D. (2020). Chatbots in retailers' customer communication: How to measure their acceptance? Journal of Retailing and Consumer Services, 56, 102176.

Rost, T. (2023, November 14). Top 5 AI algorithms retailers already use every day. Logic. https://logicinfo.com/top-5-ai-algorithms-retailers-already-use-everyday/#:~:text=Top%205%20AI%20Algorithms%20Retailers%20Already%20Use%20Every,5%205.%20Association%20Rule%20Learning%3A%20Apriori%20Algorithm%20

S. Chou, C.W. Chen, J.Y. Lin, Female online shoppers: examining the mediating roles of e-satisfaction and e-trust on e-loyalty development, Internet Res. 25 (4) (2015)

Sana Zehra Kamoonpuri, AbstractArtificial Intelligence enabled Virtual Assistants (VAs) are evolving rapidly, Araujo, T., Ashfaq, M., Canhoto, A. I., Chang, D. Y., Chong, T., Ciechanowski, L., Das, D., Bellis, E. D., Dhingra, T., Dwivedi, Y. K., Faraji-Rad, A., Fernandes, T., Garg, C. P., Grimes, G. M., Hoyer, W. D., Huang, D., Kim, Y., … Deloitte. (2023, January 7). Hi, may ai help you? an analysis of the barriers impeding the implementation and use of artificial intelligence-enabled Virtual assistants in retail. Journal of Retailing and Consumer Services. https://www.sciencedirect.com/science/article/pii/S096969892300005X?ref=cra_js_challenge&fr=RR-1

Sarah Thomson. (2021). E-commerce in 2020 report. eMarketer.

Senwaveadmin. (2021, May 7). *07 may online vs offline retail in Malaysia*. Senwave. https://senwave.com.my/2021/05/07/online-vs-offline-retail-in-malaysia/

Shabbir, J., & Anwer, T. (2018). Artificial intelligence and its role in near future. arXiv preprint arXiv:1804.01396

Simms, K., 2019. How Voice Assistants Could Change the Way We Shop. May 15, 2019. Available at:. Harvard Business Review https://hbr.org/2019/05/how-voice-assistants-could-change-the-way-we-shop.

Sohn, K., Sung, C. E., Koo, G., & Kwon, O. (2021). Artificial intelligence in the fashion industry: consumer responses to generative adversarial network (GAN) technology. International Journal of Retail and Distribution Management, 49(1), 61–80.

Speicher, M., Cucerca, S. & Krüger, A. (2017). VR shopping: Investigating the impact of virtual reality on consumer decision making. Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems (CHI '17), 1–12.

Stambor, Z. (2019, September 6). Marketers waste 21% of their marketing budgets because of Bad Data. Digital Commerce 360. https://www.digitalcommerce360.com/2019/09/06/marketers-waste-21-of-their-marketing-budgets-because-of-bad-data/

Sugriiva Paramasivam. (2019). Artificial intelligence adoption in Malaysia: Opportunities and challenges. IDC Malaysia.

Sugriiva Paramasivam. (2019). Artificial Intelligence to nearly double the rate of innovation in Malaysia by 2021: Microsoft Study – Microsoft Malaysia News Center. Microsoft Malaysia News Center. Retrieved on May 29, 2021, from https://news.microsoft.com/en-my/2019/04/02/artificial-intelligence-to-nearly- double-the-rate-of-innovation-in-malaysia-by-2021-microsoft-study/

Tarafdar, M., Beath, C. M., & Ross, J. W. (2019). Using AI to enhance business operations. MIT Sloan Management Review, 60(4), 37-44.

Team, I. E. (2021, March). Business efficiency: What it is and how to improve it. Indeed Career Guide. Retrieved December 12, 2021, from https://www.indeed.com/career-advice/career-development/business-efficiency.

Thomson, S. (2021, July 28). Five tech challenges facing retailers today. ITPro. https://www.itpro.com/marketing-comms/e-commerce/360398/five-tech-challenges-facing-retailers-today

Tjepkema, L. (2019). What Is Artificial Intelligence Marketing & Why Is It So Powerful. Emarsys: https://www.emarsys.com/resources/blog/artificial-intelligence-marketing-solutions/03.05, 53-55

Vetterli, C., Uebernickel, F., Brenner, W., Petrie, C., & Stermann, D. (2016). How Deutsche bank's IT division used design thinking to achieve customer proximity. MIS Quarterly Executive, 15(1), 37–53.

Villarreal, I. (2023, May 22). Digital Transformation in retail: Main Challenges. Base22. https://base22.com/blog/digital-transformation-in-retail-barriers-and-challenges-you-need-to-keep-in-mind/

Wamba-Taguimdje, S.-L., Fosso Wamba, S., Kala Kamdjoug, J. R., & Tchatchouang Wanko, C. E. (2020). Influence of Artificial Intelligence (AI) on firm performance: The Business Value of AI-based transformation projects. Business Proces Management Journal, 26(7), 1893–1924. https://doi.org/10.1108/bpmj-10-2019-0411

Webb, H. (2018). The adoption of AI-enabled virtual assistants: A global perspective. Journal of Strategic Marketing, 26(7), 585–599.

Weber, R. & Schütte, R. (2019). State-of-the-art and adoption of artificial intelligence in retailing. Digital Policy, Regulation and Governance, 21(3), 264–279.

Weitz, B.A., et al. (2019). Transparency in AI-based decision making. Journal of Marketing, 83(4), 101–120.

Wirth, N. (2018). Hello marketing, what can artificial intelligence help you with. International Journal of Market Research, 60(5), 435–438.

Writer, A. B., Bosze, A., & Writer, C. (2023, July 13). *Physical store vs online store: Advantages and disadvantages*. Doofinder. https://www.doofinder.com/en/blog/physical-store-vs-online-shop-advantages-and-disadvantages

Wu, W.-Y., Ke, C.-C., 2015. An online shopping behavior model integrating personality traits, perceived risk, and technology acceptance. Soc. Behav. Personal. an Int. J. 43, 85–97. https://doi.org/10.2224/sbp.2015.43.1.85.

Yang, K.C.C. & Wu, C.C. (2009). Effects of consumer experience and trust on consumer online shopping intention. Journal of Electronic Commerce Research, 10(1), 30–50.

Appendix A

Table 3.1: Issues, Challenges, and Trends of social, technological, environmental, economic, political, and value drivers.

No.	Issues and Challenges (Social)	Key Term
1.	Sensations of danger from virtual assistants, invasions of privacy, and exploitation as these systems constantly scan for a wake word, record, and retain data to customize marketing stimuli are more overt types of psychological discomfort. (Jackson, 2018)	Privacy and data security
2.	Because social interaction with other humans is fundamental to the human experience, people are unable to deliberately seek assistance from a quasi-human entity such as a virtual assistant. (Ashfaq et al., 2020)	Lack of Human Interaction
3.	Customers try to talk away from using an AI virtual assistant in place of other conventional ways to shop, such visiting physical stores or utilizing the retailer's website or app. (Henderson et al., 2021; Pillai and Sivathanu, 2020)	Accuracy and Trustworthiness
4.	The restricted natural language proficiency of virtual assistants (VAs) impedes impromptu communication, leading to discomfort and annoyance. (Melia´n-Gonza´lez et al., 2021)	Limited Language Support
5.	Some demographic groups may completely reject chatbots that seem exactly like humans since people and computers are not naturally compatible. (Fernandes and Oliveira, 2021; Mostafa and Kasamani, 2021)	Unemployment Concerns
6.	Consumers avoid using VA services while looking for product information prior to making a purchase because they would rather be safe than sorry. (Rese et al., 2020) as well as while placing an order (Malodia et al., 2022)	Ethical Considerations
7.	More Than 60% Of Consumers Agree That Long Wait Times Are The Most Frustrating Part Of Seeking Customer Support. (Sarah Thomson, 2021)	Customer Service
8.	One of the biggest problems in commerce is security and fraud detection. The retail sector must make up for over 1.3% of its overall turnover as a result of consumer and service employee theft. (Weber & Schütte, 2019).	Security and fraud detection issues
9.	AI enables marketing, gift picking, and virtual dressing, which helps customers make informed decisions during their shopping trips. (Nadimpalli, 2017).	Helps customer on their purchasing experiences
10.	More than half (67% of business leaders and 64% of workers) believe that AI will either help to do their existing jobs better or reduce repetitive tasks (Sugriiva Paramasivam, 2019).	Enhance existing jobs better and reduce repetitive tasks
11.	Cybersecurity is one of the most challenging issues for retailers in the digital economy (Cao, 2021).	Cybersecurity issue
12.	Fraud acts, such as phony reviews, fraudulent payments, and counterfeit goods, are becoming more sophisticated and varied, and they frequently have a distinct digital imprint, pattern, sequence, and structure that makes it impossible to detect them with rules-based reasoning and predictive models alone. (Cao, 2021).	Fraud issue
13.	In fact, AI is mentioned as a technological weapon to counteract the pandemic's impacts. If not, AI makes it possible to control the epidemic by implementing social distancing measures. (Di Vaio et al., 2020).	AI can help against Covid-19 pandemic
14.	A growing body of research shows that AI helps people make better decisions (Di Vaio et al., 2020).	Help to make a better decision
15.	The incentives for cooperative agreements are driven by the advantages of implementing AI. The social benefits of these kinds of partnerships center on enhancing the provision of public services and reducing administrative expenses. (Mikhaylov et al., 2018).	Improve public service
16.	In a similar vein, Grewal et al. (2017) anticipated that AI systems like Alexa, Cortana, and Siri would have a direct influence on customer purchasing habits. (Belanche et al., 2019).	People shopping behaviors changes
No.	**Issues and Challenges (Technological)**	**Key Term**
1.	Optimizing shelf space is another area where AI is being used. (Weber & Schütte, 2019).	Enhance the shelf space.
2.	AI is also utilized to optimize consumer happiness and sales prospects by customizing the store layout. (Weber & Schütte, 2019).	Improve customer satisfaction

3.	Artificial Intelligence is utilized in interactive displays and digital signs to target product advertisements based on customer demographics such as age, gender, or emotions, or based on real-time item detection on their body. (Weber & Schütte, 2019).	Helps in advertise products
4.	Advanced virtual assistants (VAs) has the ability to mimic human dialogue and can help clients at different points in the buying process (Przegalinska et al., 2019; Luo et al., 2019). They may also offer frontline support and act as their shopping assistant (Hoyer et al., 2020).	Product Database and Real-Time Updates
5.	Customization is an important benefit provided by e-commerce and m-commerce (Morosan, 2014; Chong et al., 2012) and shopping at retail stores using AI technology (Pierdicca et al., 2015; Kahn et al., 2018; Chopra, 2019)	Integration with E-commerce Platforms
6.	Customer care chatbots struggle with interpretation, which prevents them from handling complicated problems. (Folstad et al., 2018)	Natural Language Generation
7.	2020 proved to be one of the most successful years for digital retail, with sales reaching £2.96 trillion a growth of 18.4% according to eMarketer's 2020 report. (Sarah Thomson, 2021)	Tackling E-Commerce
8.	90% of consumers today expect consistent shopping experiences with their favourite retailers, wether that is in store or via an e-commerce site. (Sarah Thomson, 2021)	Digitising Customer Expectations
9.	A study by Deloitte found that 71% of consumer data was inaccurate, and by not having the right data or data segmentation to know your customers, retailers risk losing business to the competition. (Sarah Thomson, 2021)	Poor Customer Data
10.	With the increase in online shopping, 24% of consumers today are concerned about how their data is being used, despite this number being nearly half what it was in 2018. (Sarah Thomson, 2021)	Multiple Security Risks
11.	Fulfilment delays continue to affect retailers, as others struggle with product shortages, and for those sellers offering omnichannel experiences, the complexity of having multiple channels to market means that customer demands are not being met. (Sarah Thomson, 2021)	Lingering Supply Chain Issues
12.	Many outdated and barebone e-commerce platforms limit what you can do with your online store. They don't have easy-to-use workflows for authors, they don't support intuitive dashboards, and buyers find it challenging to navigate the site due to complicated and obtrusive design. (Isabel Villarreal, 2022)	Not Having an Easy-To-Update E-commerce Platform
13.	Many retailers wrongly assume that the key to happy and returning customers is an easy checkout process. And while we agree that it's important, you need a unified retail management system that covers all the facets of your retail business. (Isabel Villarreal, 2022)	Limiting Solutions to Checkout Processes
14.	Younger customers might only engage with your brand via online channels, so that's where you need to meet them when they're ready to place an order. Nevertheless, brick-and-mortar retailers are losing out as they rely on customer agents and physical location to make sales. (Isabel Villarreal, 2022)	Relying Too Heavily on Customer Agents
15.	72.9% of buyers worldwide bought something online using their phones last year. But retailers are yet to embrace the potential that device proliferation can offer. Users still run into problems with m-commerce, which primarily include inconsistent brand experience, pages and links that are too small for a mobile device, and security concerns. (Isabel Villarreal, 2022)	Failing to Deliver a Consistent Digital Experience
16.	Research indicates that over 30% of all fashion items manufactured by a brand are thrown away within the first year that is 92 million tonnes of wasted cloth. (Kyanon Digital Blog, 2021)	Inventory management and demand forecasting
17.	The complexity lies in the overwhelming number of details, steps, and processes when going full digital, as well as keeping things unified across various channels while constantly updating the resources as technologies are ever-changing. (Kyanon Digital Blog, 2021)	Complexity
18.	The applications of AI within the tasks of managing goods are advanced (Weber & Schütte, 2019).	Helps to manage goods
19.	The retail chain uses AI during replenishment tasks to reduce waste (Weber & Schütte, 2019).	Helps to reduce waste
20.	One important area of application for AI in commerce is replenishment optimization. (Weber & Schütte, 2019).	Enhance in replenishment
21.	Innovative video cameras with AI-based algorithms analyze POS activity and give a warning to the store supervisor, who is then able to convict the employee of the fraud (Weber & Schütte, 2019).	Helps in fraud detection
22.	AI optimizes these autonomous systems by actively anticipating environmental situations and looking for alternative routes, for example, in the event of a traffic jam during the loading or unloading of trucks (Weber & Schütte, 2019).	Route optimization

23.	AI is also utilized to maximize the number of each product that should be stored in various warehouses, as this changes substantially based on the warehouse, the area, the time of year, and the proximity to large cities. (Weber & Schütte, 2019).	Enhance warehouse management
24.	AI can be used to enable integrated shuttles to autonomously stock supermarket shelves. (Weber & Schütte, 2019).	Helps to fill supermarket shelves automatically
25.	The automated reading and understanding of papers by AI is the first application area. (Weber & Schütte, 2019).	Automatic reading and interpretation the data
26.	AI lowers hiring expenses and attrition by helping retailers find the right hires by evaluating an applicant's qualities and past performance. (Nadimpalli, 2017).	Reduce staff turnover rate
27.	The AI allows retails to gain sharper predicting tools that ensure the making of sharper business decisions (Nadimpalli, 2017).	Helps in decision making
28.	Retailers can use AI-powered solutions to change their interactions with their customers at different stages of a customer journey (Cao, 2021).	Enhance customers interactions
29.	Businesses can now gather massive amounts of data in real time, handle many types of data (such as text, speech, image, and numeric data), and analyze big data more efficiently thanks to artificial intelligence. (Cao, 2021).	Enables to collect huge data and analyze more effectively
30.	Conversely, the use of AI technologies improves a company's capacity for large data and data management. (Cao, 2021).	Improve data management
31.	Moreover, retailers intend to use robots to perform in- store tasks that are repeatable, predictable and manual, thereby giving staff the freedom to spend more time helping customers (Cao, 2021).	Staff can spend more time in customer services.
32.	The warehouse robotics can help retailers to improve their warehouse operations' efficiency (Cao, 2021).	Improve warehouse operations efficiency.
33.	Additionally, self-driving cars, drone delivery services, and AI-powered delivery models are the three primary ways that AI may assist retailers in streamlining and automating their delivery operations. (Cao, 2021).	Optimize and automate delivery service
34.	AI optimizes these autonomous systems by actively anticipating environmental situations and looking for alternative routes, for example, in the event of a traffic jam during the loading or unloading of trucks (Weber & Schütte, 2019).	Enhance transporting goods
35.	AI systems can analyze vast quantities of dynamically changing data and help retailers to make smart marketing decisions (Cao, 2021).	Helps to make a smart marketing decision
36.	AI enables retailers to dynamically adjust prices and offer customers different prices based on external factors and individuals' buying habits to meet a certain goal, such as boosting sales or maximizing profits (Cao, 2021).	Enable retailers to adjust price to maximize profits
37.	AI can help retailers to manage communication via two main solutions: autonomous product catalogue creation and AI-powered advertising spending optimization (Cao, 2021).	Helps retailer to manage communication
38.	Given the heavy sunk costs of opening a new physical store, store location decisions are critical to retailers. AI helps to reduce the risk of these decisions via its location intelligence technology platforms solution (Cao, 2021).	Helps decide a new store location
39.	To automate cybersecurity management, AI provides the AI-powered security platform solution to increase cybersecurity operational efficiency and efficacy (Cao, 2021).	Helps in automate cybersecurity management
40.	AI can provide an AI-based fraud detection solution, which deploys predictive analytics, behavioral analytics and ML to find anomalies in large-scale data sets in seconds (Cao, 2021).	Helps in fraud detection
41.	AI systems automate the product catalogue creation process without errors – from collecting data, enriching data and creating product experiences to normalizing product attributes (Cao, 2021).	Reduce error
42.	AI-powered hyper-personalization gives customers more satisfactory experiences and helps retailers to reach their sales targets (Cao, 2021).	Increase customer satisfaction
No.	**Issues and Challenges (Environmental)**	**Key Term**

1.	Interactivity is one of the important strategies to attract customers by the retailers which can be achieved through AI technology (Berman, 2019). Interactivity is predictors of AI-based shopping-related technology (Pantano et al., 2017; Yang and Wu, 2009; Etemad-Sajadi, 2016)	Increased Energy Consumption
2.	Advanced technology in retail stores is proposed as an important tool to reduce customer churn as it offers an exciting experience to the consumers in the store (Kim et al., 2017)	Overconsumption and Materialism
3.	Customers enjoy a shopping and playful experience in stores due to the applications of self-checkout machines (Jackson et al., 2014) and virtual reality shopping environment (Speicher et al., 2017)	Sustainable Product Recommendations
4.	Several studies address the potential for artificial intelligence (AI) to enhance the environmental sustainability of products (Frank, 2021).	Enhance environmental sustainability of products
No.	**Issues and Drivers (Economic Drivers)**	**Key Term**
1.	The inability to successfully manage that risk deters senior management from including AI in the business strategy. On the other hand, employees may fear that an AI VA might take over their jobs (Kar et al., 2021)	Job Displacement
2.	Availability of suitable data for chatbot training (Caldarini et al. , 2022)	Skill Requirements and Training
3.	AI-powered ones, on the other hand, are not marketed properly, which leads to low adoption by retail shoppers (Malodia et al., 2022)	Market Consolidation
4.	User voice contains highly personal information in the form of voice intonation, mood and energy level which might be mined for generating marketing insights, but might create unfairness perceptions from the point of view of end-users. This leads to “information asymmetry” in favor of organizations (Murtarelli et al., 2021) and they may circumvent regulations under the pretext of providing a superior customer experience (Christensen et al., 2020)	Data Monopolies and Privacy Concerns
5.	The consumers who have an innovative mindset towards technology generally possess good knowledge of technology and feel that learning new technology is interesting (Parasuraman and Colby, 2001)	Economic Growth and Innovation
6.	Dynamic pricing is one of the biggest problems faced by Ecommerce businesses selling their products worldwide (Lokanan, 2023).	Price optimization and dynamic pricing
7.	New emerging advanced technologies and applications such as 5G, cloud, artificial intelligence (AI) and big data have accelerated the growth of new businesses in Malaysia (MIDA, 2020).	Growth of new business
8.	By 2021, Artificial Intelligence (AI) will allow the rate of innovation to almost double (x1.8) and increase employee productivity improvements by 60% in Malaysia, according to the country’s business leaders (Sugriiva Paramasivam, 2019).	Increase employee productivity
9.	Robotics and Artificial Intelligence will be also opening new pages in the economics and business which are also bringing new life style and sociological side effects (Dirican, 2015).	Impact on economics and business
10.	Retailers can also use AI to help customers to make the “right” buying decision, strengthen customers’ confidence to buy and reduce the buying return rate (Cao, 2021).	Helps customer to make a right purchase decision
11.	AI enables retailers to dynamically adjust prices and offer customers different prices based on external factors and individuals’ buying habits to meet a certain goal, such as boosting sales or maximizing profits (Cao, 2021).	Boosting business sales and maximizing profits
12.	Otherwise, some scholars have evidenced that AI technology has been considered as an application to increase the levels of efficiency and production in this industry (Di Vaio et al., 2020).	Increase industry’s levels of efficiency and production
13.	Reducing unsold goods and improving cash flow are also achievable with inventory level changes. (Weber & Schütte, 2019).	Enhance business’s cash flow
14.	AI is also utilized to optimize consumer happiness and sales prospects by customizing the store layout. (Weber & Schütte, 2019).	Improve sales opportunities
15.	AI lowers hiring expenses and attrition by helping retailers find the right hires by evaluating an applicant's qualities and past performance. (Nadimpalli, 2017).	Reduce hiring costs
No.	**Issues and Challenges (Political)**	**Key Term**
1.	Using terms like "social agent," "intelligent agent," or "virtual agent" to describe the Virtual Assistant to end users is incorrect. (Araujo, 2018)	Regulatory Framework

2.	According to Weitz et al. (2019), transparency is crucial to boosting consumer trust in AI, but implementing it is costly. (Mayenberger, D., 2021)	Data Sovereignty
3.	Future legislative changes would prohibit some of the technologically sophisticated VAs' features (Barakat and Dabbous, 2019), which would provide another operational challenge for companies looking to implement them.	National Security
4.	According to a global survey, only 12% of the most digitally advanced businesses had integrated AI-enabled virtual assistants (VAs) into various business processes and roles. (Webb, 2018)	Digital Divide
5.	Artificial intelligence (AI) has advanced recently, leading to the creation of systems that aid political campaigns in winning elections. (Kane, 2019).	AI tools are used in politics elections
6.	Comprehensive approaches to the law and regulation of AIs and robots have been proposed, possibly in the hope to assist decision makers (Petit, 2017).	Law and regulation of AI are used to assist decision makers
No.	**Issues and Challenges (Value)**	**Key Term**
1.	Fear of reputational harm should a virtual assistant breakdown within the company. (Canhoto and Clear, 2020)	Cultural Sensitivity
2.	Additionally, the AI Virtual Assistant's algorithms need to treat every group of people equally and impartially. (Leszkiewicz et al., 2022)	Bias and Discrimination
3.	When given underrepresentative or inherently biased data to train on, or when they gradually pick up such behavior from user-generated input, virtual assistants may behave unethically, discriminatorily, or abusively. (da Silva et al., 2021)	Ethical Consumption and Sustainability
4.	It is challenging to determine which function each of the various players involved in the creation of voice-activated virtual assistants (VAs) legally holds because the user's voice is treated as biometric data. (Osborne Clarke Insights, 2021)	Privacy and Consent
5.	Virtual assistants can co-create value with clients, but they also have the capacity to co-destruct it (Castillo et al., 2021). For this reason, it can be difficult to trace the origin of AI decisions back to a human or algorithm. As a result, accountability is an issue. (GIZ India, 2021)	Transparency and Accountability
6.	Recent published literature has shown that AI can be used as a human resource tool to boost employee engagement and performance (Chopra, 2019).	Improve people performance in their job position
7.	The real benefit of AI is when it is used to improve people’s lives (Cao, 2021).	Improve people’s lives
8.	Thus, a lot of AI powered technologies have been developed with potential to improve the economy by improving the quality of life significantly (Dhanabalan & Sathish, 2018).	Improve the quality of life